

WHAT IS CLAIMED IS:

1. A piezoelectric oscillator, comprising:
a plurality of leads formed of one or more lead frames; and
terminals formed on said plurality of leads and distanced one from another
being arrayed in multiple tiers in a direction substantially perpendicular to a main plane
of the lead frame.
2. The piezoelectric oscillator according to Claim 1, further comprising:
said terminals being at least connection terminals to connect with a
piezoelectric resonator and mounting terminals to mount to a mounting board;
said piezoelectric resonator formed by sealing a piezoelectric resonator
element within a resonator package being mounted on said connection terminals;
an IC forming an oscillating circuit being mounted on said lead frame; and
said lead frame and said piezoelectric resonator being sealed within said
package such that the principal surface of said mounting terminals are exposed outwards,
thereby forming a resin package.
3. A piezoelectric oscillator including a layered lead frame, comprising:
two lead frames;
connection leads to connect with a piezoelectric resonator being formed on
one of said lead frames on one side and said connection leads are erected to said one side so
as to form connection terminals;
mounting leads to mount to a mounting board are formed on the other of said
lead frames on said other side and said mounting leads are erected to said other side so as to
form mounting terminals; and
an IC forming an oscillating circuit being mounted on said layered lead frame,
said piezoelectric resonator formed by sealing a piezoelectric resonator element within a
resonator package being mounted on said layered lead frame; and
said layered lead frame and said piezoelectric resonator being sealed within a
resin package such that the principal surface of said mounting terminals are exposed
outwards, thereby yielding a completed article.
4. A piezoelectric oscillator, comprising:
a layered lead frame configured of a lead frame on one side where connection
leads are formed and a lead frame on the other side where mounting leads are formed, being
layered;

an IC configuring an oscillating circuit and mounted on said layered lead frame;

a piezoelectric resonator mounted to connection terminals provided on said connection leads with a piezoelectric resonator element being sealed within a resonator package;

a resin package, said layered lead frame and said piezoelectric resonator being sealed therein with the principal surface of mounting terminals provided on said mounting leads exposed outwards; and

one of said connection leads and said mounting leads being bent in the direction opposite to the plane of layering.

5. The piezoelectric oscillator according to Claims 3 or 4, further comprising:
adjusting terminals being formed on said layered lead frame to inspect the properties of said IC, adjust the properties, and/or confirm conduction between said piezoelectric resonator and said connection terminals, said adjusting terminals being externally exposed, and said layered lead frame and said piezoelectric resonator being sealed inside the resin package, thereby forming a resin package.

6. The piezoelectric oscillator according to Claim 5, said mounting terminals being formed at the same height as said adjusting terminals.

7. The piezoelectric oscillator according to Claim 5, said adjusting terminals being exposed at the bottom face of said resin package.

8. The piezoelectric oscillator according to Claims 3 or 4, said lead frame at the other side having the portions thereof other than said mounting terminals formed thinner than said mounting terminals.

9. The piezoelectric oscillator according to Claims 3 or 4, said lead frame at the one side having the portions thereof other than said connection terminals formed thinner than said connection terminals.

10. The piezoelectric oscillator according to Claims 3 or 4, said mounting terminals being provided at a position higher than the lower face of said resin package.

11. The piezoelectric oscillator according to Claims 3 or 4, said layered lead frame and said piezoelectric resonator being sealed within a resin package such that the side face of said mounting terminals, as well as the principal surface of said mounting terminals, are exposed outwards, thereby forming a resin package.

12. The piezoelectric oscillator according to Claims 3 or 4, the tips of said mounting terminals protrude from the side face of said resin package.

13. A piezoelectric oscillator according to Claims 3 or 4, said mounting leads being formed with irregular shapes.

14. The piezoelectric oscillator according to Claims 3 or 4, said mounting terminals having at least one or more recesses or protrusions formed on said principal surface.

15. The piezoelectric oscillator according Claims 3 or 4, said mounting terminals having at least one or more recesses or protrusions formed on the face joining the resin, opposite to said principal surface.

16. The piezoelectric oscillator according Claims 3 or 4, said connection leads being formed with irregular shapes.

17. The piezoelectric oscillator according to Claims 3 or 4, said connection terminals having at least one or more recesses or protrusions formed on one or both of the principal surface to join to said piezoelectric resonator, and the opposite face.

18. The piezoelectric oscillator according to Claims 3 or 4, notches permitting intrusion of resin being formed on one or both of said connection leads and said mounting leads.

19. The piezoelectric oscillator according to Claims 3 or 4, recesses or protrusions being formed on the sides of one or both of said connection terminals and said mounting terminals.

20. The piezoelectric oscillator according to Claims 3 or 4, the sides of one or both of said connection terminals and said mounting terminals being inclined in the thickness direction thereof.

21. The piezoelectric oscillator according to Claims 3 or 4, a portion of said mounting leads protruding from the side face of said resin package, and bending downwards, so as to be capable of being mounted to a mounting board.

22. The piezoelectric oscillator according to Claim 5, a portion of said adjusting terminals protruding from the side face of said resin package, and bending downwards, so as to be capable of being mounted to a mounting board.

23. The piezoelectric oscillator according to Claims 3 or 4, said IC being mounted to said one lead frame.

24. The piezoelectric oscillator according to Claims 3 or 4, retaining portions to retain in the height direction of said piezoelectric resonator being formed on the side face of said resonator package, and then said layered lead frame and said piezoelectric resonator being sealed within the resin package, thereby forming the resin package.

25. The piezoelectric oscillator according to Claims 3 or 4, in order to connect the terminals of said IC and said mounting terminals, a pair of wiring leads being formed on one lead frame on said one side, said wiring leads being erected in said one side so as to form a pair of wiring terminals, and one of said pair of wiring leads being connected to one of said IC terminals or said mounting terminals and the other of said pair of wiring leads being connected to the other of said IC terminals or said mounting terminals, with a pair of electrode pads connected to each of said pair of wiring terminals and a wiring pattern mutually connected to each of said pair of electrode pads having been formed on said piezoelectric resonator.

26. The piezoelectric oscillator according to Claims 3 or 4, said layered lead frame and said piezoelectric resonator being sealed within the resin package, with the upper face of a lid of said piezoelectric resonator externally exposed, thereby forming the resin package.

27. The piezoelectric oscillator according to Claims 3 or 4, said lid of said piezoelectric resonator being sealed within the resin package, thereby forming the resin package.

28. A method to manufacture a piezoelectric oscillator, said method comprising:
forming connection leads to connect with a piezoelectric resonator on one of two lead frames on one side and erecting said connection leads to said one side so as to form connection terminals, forming mounting leads to mount to a mounting board on the other of said lead frames on said other side, and erecting said mounting leads to said other side so as to form mounting terminals, and layering said lead frames to form a layered lead frame;

mounting an IC forming an oscillating circuit on said layered lead frame;

mounting on said layered lead frame, said piezoelectric resonator formed by sealing a piezoelectric resonator element within a package; and

sealing said layered lead frame and said piezoelectric resonator within a resin package such that the principal surface of said mounting terminals are exposed outwards.

29. A method to manufacture a piezoelectric oscillator, said method comprising:
forming connection leads to connection with a piezoelectric resonator on one of two lead frames on one side and erecting said connection leads to said one side so as to form connection terminals, and forming mounting leads to mount to a mounting board on the other of said lead frames on said other side and reducing the thickness of the base side of said mounting leads to form mounting terminals at the tips there, and layering said lead frames to form said layered lead frame;

mounting an IC forming an oscillating circuit on said layered lead frame;

mounting on said layered lead frame, said piezoelectric resonator formed by sealing a piezoelectric resonator element within a package; and

sealing said layered lead frame and said piezoelectric resonator within a resin package such that the principal surface of said mounting terminals are exposed outwards.

30. The method to manufacture a piezoelectric oscillator according to Claim 29, further comprising:

a removing resin adhering to the principal surface of said mounting terminals.

31. The method to manufacture a piezoelectric oscillator according to Claim 29, said sealing within said resin package being performed by pressing the principal face of said mounting terminals against a mold face, and the unnecessary portions of said mounting terminals are cut off subsequently by cutting said resin package off from the frame portion of said lead frame.

32. An electronic device, having the piezoelectric oscillator according to Claim 1.